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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,237	07/19/2005	Eriko Matsui	112857-457	1612

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EXAMINER	
LULIS, MICHAEL P	
ART UNIT	**PAPER NUMBER**
2824	

MAIL DATE	DELIVERY MODE
10/09/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/540,237	MATSUI ET AL.	
	Examiner	Art Unit	
	Michael Lulis	2824	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07/28/2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,6-8,11-13 and 15-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6-8,11-13 and 15-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *07/27/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☒ Other: *Search History*.

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 07/27/2007 has been considered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. **Claims 1-3, 6, and 7 are rejected under 35 U.S.C. 102(e) as being anticipated by Swager (US 20020040805 A1).**

4. **Regarding claim 1**, Swager discloses a functional molecular element comprising: a molecule (para 0073) with permittivity anisotropy and/or a dipole moment; a metal ion (para 0066); and a conjugated molecule (para 0064), wherein the molecule with permittivity anisotropy and/or the dipole moment and the conjugated molecule form a complex with the metal ion, and wherein conductivity of the conjugated molecule is changed (para 0062) by changing the orientation of the molecule with the permittivity anisotropy and/or the dipole moment by the action of the electric field..

5. **Regarding claim 2**, Swager discloses a functional molecular element according to claim 1 (see above), wherein the molecule (para 0073) with the permittivity anisotropy and/or the dipole moment is a Lewis base molecule.

6. **Regarding claim 3**, Swager discloses a functional molecular element according to claim 1 (see above), wherein the metal ion (para 0066) is a Lewis acid.

7. **Regarding claim 6**, Swager discloses a functional molecular element according to claim 1 (see above), wherein the conjugated molecule is polypyrrole (para 0066).

8. **Regarding claim 7**, Swager discloses a functional molecular element according to claim 1 (see above), wherein the molecule with the permittivity anisotropy and/or the dipole moment is 4-pentyl-4'-cyanobiphenyl (para 0073).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. **Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swager (US 20020040805 A1)**.

11. **Regarding claim 8**, Swager discloses a functional molecular element according to claim 1 (see above). Swager does not disclose expressly that the metal ion is a silver ion. However, Swager teaches that the metal ion can be a transition metal ion (claim 16). It would have been obvious at the time of invention to a person of ordinary skill in the art to choose a silver ion as the metal ion in the functional molecular element of

Swager. The motivation would have been that silver is a well-known transition metal ion (para 0126).

12. **Claims 11-13 and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swager (US 20020040805 A1) in view of Koma (US 5608556).**

13. **Regarding claim 11**, Swager discloses a functional molecular device, comprising: a molecule (para 0073) with permittivity anisotropy and/or a dipole moment; a metal ion (para 0066); a conjugated molecule (para 0064), the molecule with permittivity anisotropy and/or the dipole moment and the conjugated molecule forming a complex with the metal ion; and an input/output means (para 0053) for the conjugated molecule, wherein a conductive path is formed by the conjugated molecule (Swager para 0064) and the conductivity of the conductive path is controlled (Swager para 0063) by the orientation of the molecule with the permittivity anisotropy and/or the dipole moment. Although Swager discloses that an orientation of the molecule with the permittivity anisotropy and/or the dipole moment is changed (para 0063) by an action of an electric field (the molecule-scale field intrinsic to charge transfer), Swager does not disclose expressly an *electric field applying means that applies an electric field* to the molecule with permittivity anisotropy and/or the dipole moment and that the conductivity of the conductive path is controlled by changing the electric field that acts upon the molecule with the permittivity anisotropy and/or the dipole moment. Koma discloses an electric field applying means that applies an electric field to a molecule with permittivity anisotropy and/or the dipole moment (column 3 lines 25-32). Swager and Koma are analogous art because they are from the same field of endeavor, devices using liquid

crystal molecules. It would have been obvious at the time of invention to a person of ordinary skill in the art to add the electric field applying means that applies an electric field to the molecule with permittivity anisotropy and/or the dipole moment of Koma to the device of Swager. The motivation for doing so would have been to control the orientation of the molecules (Koma column 3 lines 25-32).

14. **Regarding claim 12**, it would have been obvious at the time of invention to a person of ordinary skill in the art to combine Swager and Koma to yield the functional molecular device according to claim 11 (see above), wherein the input/output means inputs and outputs electrons (Swager para 0052).

15. **Regarding claim 13**, it would have been obvious at the time of invention to a person of ordinary skill in the art to combine Swager and Koma to yield the functional molecular device according to claim 11 (see above). Swager discloses that the metal ion (para 0066) and the conjugated molecule (para 0064) are disposed at least between opposing electrodes (para 0053), and an output corresponding to the electric field is taken from at least one of the opposing electrodes. Swager does not disclose expressly that the molecule with permittivity anisotropy and/or the dipole moment is oriented on an electrode for applying the electric field. Koma discloses that a molecule (figure 4, 41) with permittivity anisotropy and/or the dipole moment is oriented on an electrode (figure 4, 22) for applying an electric field. Swager and Koma are analogous art because they are from the same field of endeavor, devices using liquid crystal molecules. It would have been obvious at the time of invention to a person of ordinary skill in the art to orient the molecule with permittivity anisotropy and/or the dipole moment in the device

of Swager on an electrode for applying the electric field, as taught by Koma. The motivation for doing so would have been to control the orientation of the molecules (Koma column 3 lines 25-32).

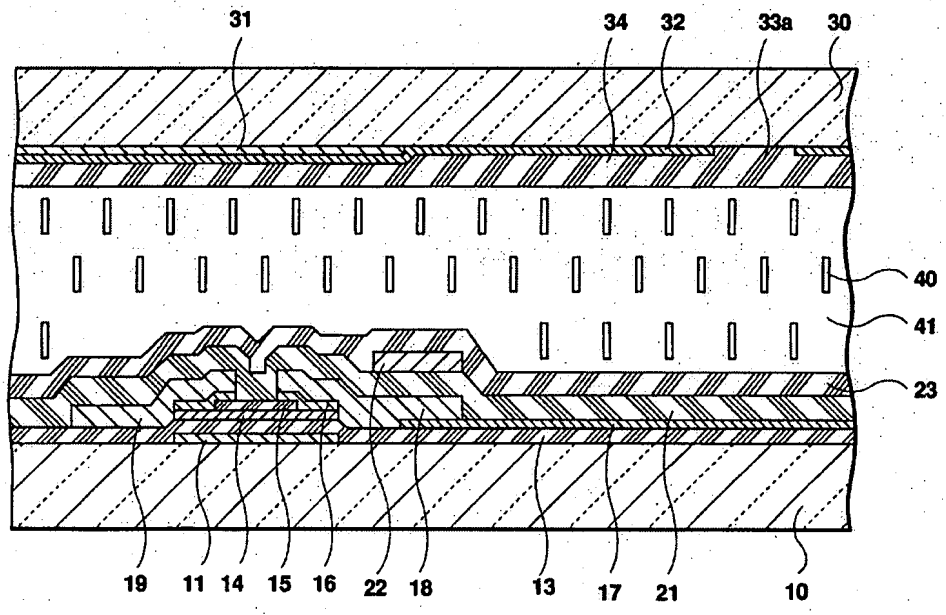

Fig. 4

Koma Figure 4

16. **Regarding claim 16**, it would have been obvious at the time of invention to a person of ordinary skill in the art to combine Swager and Koma to yield the functional molecular device according to claim 11 (see above). Although Swager discloses that an orientation of the molecule with the permittivity anisotropy and/or the dipole moment is changed (para 0063) by an action of an electric field (the molecule-scale field intrinsic to charge transfer), Swager does not disclose expressly an *electric field applying means that applies an electric field* to the molecule with permittivity anisotropy and/or the dipole moment, wherein by changing the electric field that acts upon the molecule with

permittivity anisotropy and/or the dipole moment, the positional relationship of the molecule with respect to an orientation of the electric field, the angle between the molecule and the conjugated molecule, an acting position of the metal ion, or a three-dimensional structure of the complex changes. Koma discloses an electric field applying means that applies an electric field to a molecule with permittivity anisotropy and/or the dipole moment (column 3 lines 25-32). Swager and Koma are analogous art because they are from the same field of endeavor, devices using liquid crystal molecules. It would have been obvious at the time of invention to a person of ordinary skill in the art to add the electric field applying means that applies an electric field to the molecule with permittivity anisotropy and/or the dipole moment of Koma to the device of Swager such that by changing the electric field that acts upon the molecule with permittivity anisotropy and/or the dipole moment, the positional relationship of the molecule with respect to an orientation of the electric field, the angle between the molecule and the conjugated molecule, an acting position of the metal ion, or a three-dimensional structure of the complex changes. The motivation for doing so would have been to control the orientation of the molecules (Koma column 3 lines 25-32).

17. **Regarding claim 17**, it would have been obvious at the time of invention to a person of ordinary skill in the art to combine Swager and Koma to yield a functional molecular device according to claim 11 (see above), wherein a layer of the conjugated molecule and a layer of the molecule (Swager para 0073) with permittivity anisotropy and/or the dipole moment form a multilayer structure (Swager para 0062).

18. **Regarding claim 18**, it would have been obvious at the time of invention to a person of ordinary skill in the art to combine Swager and Koma to yield a functional molecular device according to claim 17 (see above). Swager discloses that second and third electrodes (figure 26, 152 and 153) are formed on a substrate (figure 26, 151) so as to not contact one another and that the laminated structure (of para 0062 and 0073 in the place of figure 26, 155) is disposed at least between the second electrode and the third electrode. Swager does not disclose that the substrate is an insulating layer provided on a first electrode and that a fourth electrode is provided directly, or via an insulating layer, on the layer of the molecule with permittivity anisotropy and/or the dipole moment of the multilayer structure. Koma discloses a substrate (figure 4, 23) that is an insulating layer provided on an electrode (figure 4, 22) and that another electrode (figure 4, 32) is provided directly, or via an insulating layer, on a layer of a molecule (figure 4, 41) with permittivity anisotropy and/or the dipole moment of the multilayer structure. Swager and Koma are analogous art because they are from the same field of endeavor, devices using liquid crystals. It would have been obvious at the time of invention to a person of ordinary skill in the art to add Koma's substrate that is an insulating layer provided on an electrode and another electrode provided directly, or via an insulating layer, on a layer of a molecule (figure 4, 41) with permittivity anisotropy and/or the dipole moment of the multilayer structure to the device of Swager. The motivation for doing so would have been to control the orientation of the molecules (Koma column 3 lines 25-32).

19. **Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swager (US 20020040805 A1) in view of Koma (US 5608556) and in further view of Shanks (US 4109241).**

20. Regarding claim 15, it would have been obvious at the time of invention to a person of ordinary skill in the art to combine Swager and Koma to yield a functional molecular device according to claim 11 (see above). Swager does not disclose expressly the application of a high frequency electric field. Shanks teaches the use of a high frequency electric field (column 4 lines 45-50). Swager and Shanks are analogous art because they are from the same field of endeavor, devices using liquid crystal molecules. It would have been obvious at the time of invention to a person of ordinary skill in the art to apply a high frequency electric field in the device of claim 11. The motivation for doing so would have been to exceed the relaxation time of the liquid crystal (Shanks column 4 lines 45-50).

Response to Arguments

21. Applicant's arguments filed 07/25/2007 have been fully considered but they are not persuasive.

22. Applicant argues that changing the orientation of a molecule by charge transfer is not "by the action of an electric field," even though charge transfer occurs by the action of an electric field on the molecular scale. The interpretation of charge transfer as an action of an electric field can be excluded by claiming that the action of an electric field is an external electric force on the molecule.

23. Applicant argues that sharing a common technological material, liquid crystals, does not establish Swager and Koma as analogous art. While it is always possible to define mutually exclusive fields of endeavor, it is reasonable to presume that one of ordinary skill in the art of liquid crystals would be aware of both references and cognizant of reasons to combine them.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

When responding to this office action, applicants are advised to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist the examiner in locating appropriate paragraphs.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Lulis whose telephone number is (571) 272-

9015. The examiner can normally be reached on 8:30 AM to 5:00 PM Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Elms can be reached on (571) 272-1869. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ML
01 October 2007

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